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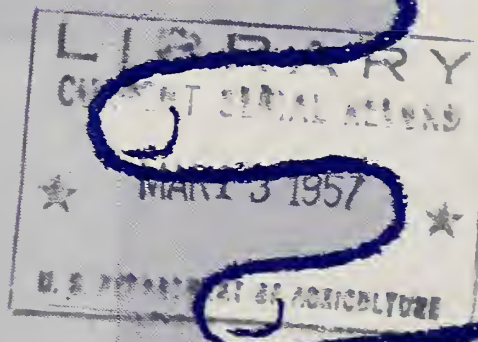
# AGRICULTURAL Research

MARCH 1957

5/9



Breeding plan  
• see page 13



Top repellent  
• see page 6

Rural change  
• see page 3

UNITED STATES  
DEPARTMENT OF  
AGRICULTURE





# AGRICULTURAL Research

Vol. 5—March 1957—No. 9

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## Contributions

Crop-improvement work has brought some remarkable changes to the farms in this country over the last 20 years.

The USDA Yearbook of 1936 commented:

"There is greater and greater stress on hybridization as the chief tool of the breeder. Formerly the stress was chiefly on selecting particularly good types, getting them to breed true, and using them to replace the old ones. Now the breeder tends rather to formulate an ideal in his mind and actually create something that meets it as nearly as possible by combining the genes from two or more organisms."

Since then, scores of results have been achieved over a broad front—in our understanding of male sterility to produce hybrids in sorghum and sugarbeets as well as corn; in our knowledge of polyploids to make crosses that were formerly impossible; in use of irradiation from nuclear products to induce mutations that have valuable germ plasm.

Our farmers have had a continuing supply of superior new varieties. More than 9 acres out of 10 in sugar, cotton, and oil crops are planted to varieties released since 1935. Only one-fourth of the 1954 grain acreage was planted to varieties that were grown commercially in 1935. Nearly half the acreage planted to vegetables is in new varieties. Eight out of 10 acres in hay are still planted to varieties of the early thirties; but here, too, we're making gains.

Our crop-improvement efforts have helped us produce abundantly. Now they're helping us stabilize agriculture by giving farmers varieties that are highly productive in the face of a wide range of hazards. These varieties can be grown more efficiently—they make better use of fertilizer and water and lend themselves better to mechanization. We have enhanced the qualities that make these varieties interesting to consumers for food and other purposes. Furthermore, our work has helped establish entirely new crops.

Along with these highly practical contributions, our crop-improvement efforts have added to scientific knowledge. They have given us new concepts and techniques to tackle tough jobs. They hold exciting prospects for the future.

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AGRICULTURAL RESEARCH SERVICE  
United States Department of Agriculture



# RURALITES

## IN OUR EXPANDING ECONOMY

**In the picture: fewer farms, more jobs elsewhere, related work open, industry needed, extra migrants**



■ AS OUR COUNTRY'S economy changes, so does the rural pattern.

Early Congressional enactments encouraged homesteading. And farms increased until 1920. Since then, the number has declined. New techniques that increase yields and decrease needs for labor have brought economic progress. Fewer people are needed on farms to produce food and fiber although our nonfarm population is steadily increasing. (One farm worker now supports 19 other persons compared to 5 in 1870.) This means more people are available to produce an expanding volume of products and services—totaling more than \$400 billion a year at present.

Let's look at some of the things that are happening to ruralites during this unprecedented period:

### 1. Efficiency promotes larger family farms

Family-operated farms remain a dominant characteristic of agricul-

ture, a USDA study shows. The trend toward larger and fewer commercial farms has come about through growth in size of family farms—a result of new technology.

#### Research has part in trend

Commercial farms have decreased in number as well as in the proportion they comprise of the total farms, reports ARS production economist J. V. McElveen. The number of commercial farms has decreased by 1.6 million in the last quarter of a century. Though fewer in number, commercial farms are becoming much larger in size measured by the physical volume of farm production marketed. These farms are using machinery and applying results of research to such things as fertilizers, insecticides, and plant varieties.

With the development of more efficient methods has come a decrease in commercial farms from 75 percent in 1930 to 65 percent in 1954. (These include farms with sales of \$2,500 or more, also farms with sales of \$250 to

\$2,500 where the operator worked less than 100 days at off-farm jobs and other income of the family did not exceed farm sales.)

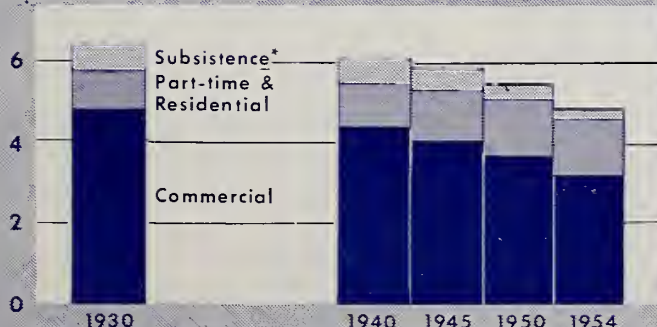
Increases in business volume and the trend to larger and fewer commercial farms do not mean a trend toward large-scale farming, says McElveen. The number of large-scale operations (most depend largely on hired labor) among commercial farms has decreased proportionately the same as family farms (operated primarily with family labor). Among commercial farms, 96 percent are still family operations producing more than two-thirds of our output. Only the remaining 4 percent are large-scale farms. These proportions have remained constant for years.

#### Some operations too small

Among the family operations, however, there has been a continuous problem of many farms that are too small in business volume to take full advantage of new techniques in farming. About a third of the family op-

**Number Of Farms Is Declining**

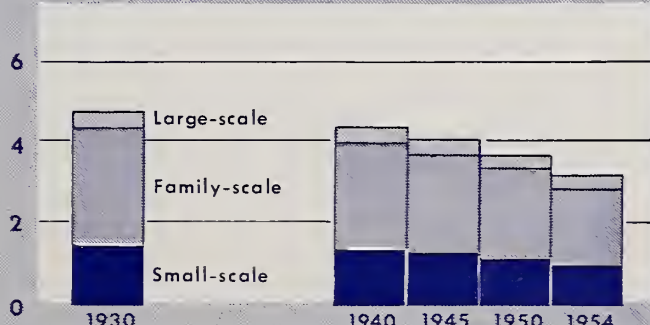
MILLIONS



\* EARLIER YEARS INCLUDE SOME PLACES NOT REGARDED AS FARMS IN 1950 AND 1954 CENSUSES

**Family Farms Still Dominate COMMERCIAL FARMS**

MILLIONS









Possibilities exist for cow testing, artificial breeding, livestock trucking, and well drilling. There are seasonal jobs of fruit spraying, airplane dusting, grain combining, and hay and straw baling. Jobs such as tractor driving and sheep shearing are open. There also are opportunities for men to repair and service farm machinery, to handle storage and warehousing of products, and to operate nurseries and greenhouses.

## 4. Industry provides jobs for low-income areas

Location of new industries in rural sections and migration of farmers to cities for industrial jobs provide other sources of income for farm people, particularly in low-income areas. Construction jobs under the new multi-billion-dollar highway development program alone will provide thousands of opportunities.

### Representative area studied

Take West Virginia. Rural residents—96 percent of them—are identified partly or fully with nonfarm work. This was shown in a cooperative study by USDA and the West Virginia Agricultural Experiment Station. Under the direction of agricultural economists J. R. Motheral and W. H. Metzler, of ARS, and W. F. Porter of the station, 2,287 persons in 875 households were interviewed in the Upper Monongahela Valley—a representative low-income area.

Only 5 percent of the households surveyed in rural areas depend solely

on agriculture. Forty-one percent are part-time operators also receiving income from nonfarm activities. Another 40 percent do no farm work. And 14 percent received income only from nonfarm sources such as rent, royalties, public assistance, retirement funds, or Social Security.

### Resources, labor available

The local coal mining industry, which originally supplemented agriculture, no longer needs as many workers. Few of these people are interested in cultivating farms where yields and incomes are small because of rough topography and lack of capital to operate efficiently. These people prefer development of other local industries to leaving the area. Local natural resources plus a reserve of manpower should constitute a basis for several lines of industrial development, say the economists.

Eighty percent of the workers interviewed had industrial or business experience. They had adjusted to regular employment and acquired skills valuable in nonfarm work.

The average person interviewed worked 154 days a year. Men averaged 185 days, women 92. When agriculture was the main source of income, they worked an average of 58 days. Those who earned nonfarm incomes worked an average of 187 days annually. Earnings for home-farm workers averaged \$132 a year (\$2.25 a day) compared with \$2,206 a year (\$11.85 a day) off the farm.

## 5. Need for migratory help brings problems

Need for seasonal migratory labor continues even though economic opportunities are decreasing for young farm men on a year-round basis, according to USDA studies.

Agricultural economist O. J. Scoville, of ARS, says there will be a con-

tinued demand for foreign migratory workers as long as there is a high level of industrial employment. He points out that with a lower level of industrial employment, the supply of seasonal workers would be greater, demand for migrants less.

Continued need for migrants brings problems in improving laborers' social and economic conditions. These problems must be studied in relation to where workers are hired.

### Increased requirement seen

A recent study by agricultural economists J. R. Motheral and R. W. Hecht, for example, indicates a need for mobilizing more effective programs for these workers in southwest Michigan during the next 4 to 5 years. Results of a survey for the President's Committee on Migratory Labor in the fruit and vegetable area show that the need for migratory workers will increase approximately 10 to 15 percent.

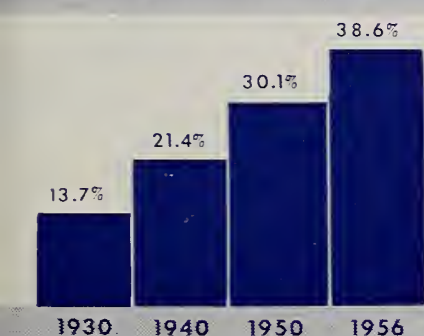
Researchers say a large part of the demand in Michigan might be met by intensive efforts toward maximum utilization of labor currently available during the peak season.

June and July—when increased acreages of asparagus, strawberries, and cherries are harvested—are expected to be the most critical months in the State. Survey conclusions are based on the assumptions that trends in consumer taste will continue with little interregional change of competition, that national population will increase, and that economic activity and disposable income will remain at about the same high levels.

### Other surveys are planned

The survey in Michigan is one of four planned for the President's Committee. Other sections to be studied are the San Joaquin Valley in California, the Columbia Basin in Washington, and the Delta area of Arkansas. Farmers in all four areas employ large numbers of migrants.☆

**More Employed Farm People Have Nonfarm Jobs**





# BEST INSECT REPELLENT YET

**A new product—effective,  
long-lasting, pleasant—will  
soon be on the market**



**NEW REPELLENT**—diethyl toluamide—wiped on upper section of entomologist's arm in Orlando, Fla., laboratory keeps mosquitoes away. (Insects that appear to be on forearm actually are in foreground against the screen.) Only the untreated hand and lower part of arm exposed in this test cage are attacked by mosquitoes.

■ THE BEST ALL-PURPOSE insect repellent ever developed will be put on the American market this spring.

A product of USDA research, the new repellent successfully defends against attacks by mosquitoes, chiggers, ticks, fleas, and biting flies.

It provides long-lasting protection for outdoor laborers and sportsmen. Its pleasant lotion feel recommends it to picnickers and backyard gardeners. It can be safely applied to the skin or to any animal fiber.

The repellent is an organic chemical, diethyl toluamide. It is not new,

but its promise as a repellent was unknown until it was synthesized by ARS chemists at the Agricultural Research Center, Beltsville, Md., and tested by entomologists at the Orlando, Fla., laboratory in 1952.

## Rubbing resistance is high

These scientists are particularly pleased with the chemical's resistance to rubbing. Some of a repellent applied to the skin may be absorbed, but much of it is simply worn away by normal activities of the wearer. "Wipe tests" developed to simulate this wear-

ing-off showed diethyl toluamide to be at least twice as longlasting as the next best repellent. Under normal circumstances, one treatment with this new repellent should give protection for several hours, depending on the strength of the repellent chemical in the composition.

Tests on different species of mosquitoes show diethyl toluamide to be as good or better than any other repellent in each case. More important, it is better against *all* mosquito species than any other single chemical or combination of chemicals.

**EXPOSED HANDS** of scientific trio have been treated with different insect repellents, including the new chemical. Researchers compare effectiveness of different chemicals by counting number of mosquito bites in a given time. Test spots in Florida are chosen for the type and the number of mosquitoes in area.



**TREATED SOCKS** are worn to measure chemical's ability to repel ticks in box of straw. Trials were also made in field to check chiggers—best stopped by treating trouser cuffs or stockings rather than by treating ankles or legs.







## Breed Cows for Feed Efficiency?

Diethyl toluamide is superior to other repellents against the yellow fever, salt marsh, and irrigation water and snow water mosquitoes. It is as good as the best of the others for sub-arctic and malaria species.

The new repellent is better than all other repellents tested against the stable fly, just as effective against the deer fly and sand flies.

It is outstanding in repellency against the rat flea. Against ticks, it is the best of commercially available repellents. Against chigger mites, the chemical is completely effective till treated clothing is rinsed or washed.

### Fabrics can be impregnated

Clothing and other fabrics can be readily impregnated with diethyl toluamide by saturating them with emulsions or dry-cleaning preparations containing the repellent chemical.

Biological experiments carried out at Orlando have pinpointed the active repellency of diethyl toluamide. Three isomers—meta, ortho, and para—present in the chemical are respectively most, less, and least repellent to insects. The scientists have established that diethyl toluamide has its optimum repellency when formulated with about 70 percent of the meta isomer and 30 percent of the ortho and para isomers combined. This is near the isomer ratio to be contained in the forthcoming marketed repellent.

### Lab yields many repellents

Most of the world's important repellent developments of the past 15 years have come from research done at the Orlando laboratory in close cooperation with military agencies and chemical companies. Work initiated there under the auspices of the U. S. Army in 1942 resulted in development of a repellent mixture that was used by American servicemen the world over. The present-day standard military repellent, M-2020, was developed in research at Orlando in 1948. ☆

■ WORK RECENTLY STARTED at USDA's Agricultural Research Center, Beltsville, Md., may someday lead to breeding dairy cattle for efficiency in converting feed to milk, as well as for other established factors.

*Productivity* has long been recognized as an inherited factor and is the key criterion for selection in most dairy breeding programs today. Last year, a preliminary study of records at Beltsville indicated that another likely genetic factor is *feed efficiency*—the ratio of milk or butterfat produced to the intake of digestible nutrients.

Analysis of Beltsville herd records by dairy husbandman N. W. Hooven showed that feed efficiency was consistent among the daughters of each sire and different between sire groups. This in turn showed that there may be a sire influence on feed efficiency. Statistical analysis further suggested strongly that productivity and feed efficiency may be, at least to some extent, genetically independent.

The analysis covered one lactation period for four individual sire groups of cows. The findings are not entirely conclusive, however, since they're based on just one lactation for only about 85 cows.

In the new study, many sire groups are to be tested for two lactation periods each. Animals are kept on three different feeding plans to determine the one at which feed efficiency can best be measured. This is the first attempt by these methods to understand the part inheritance plays in a lactating dairy cow's feed efficiency.

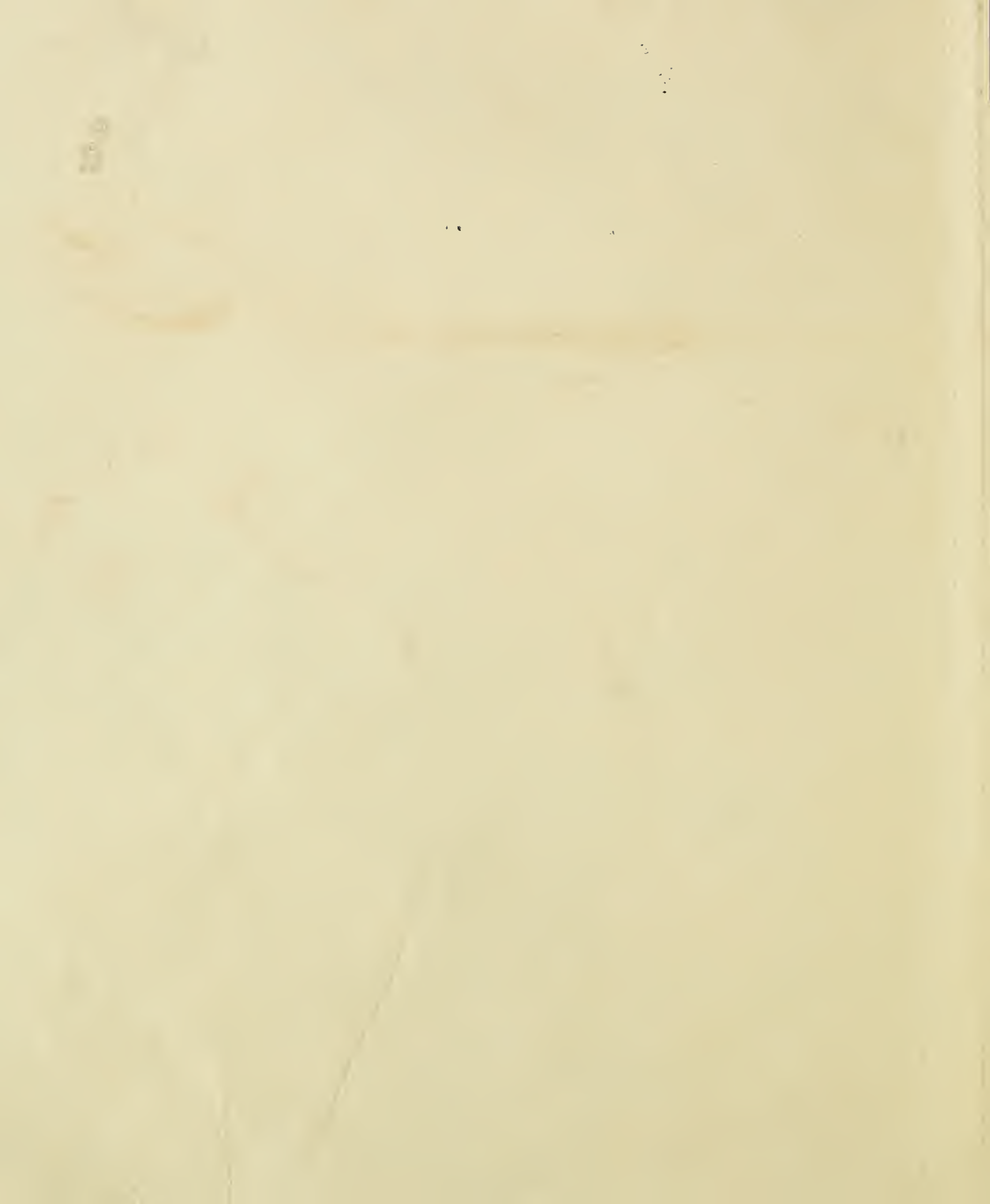
The first group of cows receives a ration measured to give the same total gain in body weight to each cow of the group during the last 8 months of the lactation. All animals are weighed weekly, and after the sixty-third day (herd's average point of lowest weight) the nutrient supply is readjusted in an effort to assure this gain in each animal.

The second group is underfed throughout the lactation period. Each cow receives a ration of the same composition and the same amount throughout the test, regardless of her production and change in body weight. The level of underfeeding has been established at 13 percent less than average nutrient requirements of cows in the Beltsville herd.

The control group receives the regular Beltsville herd ration based on milk production and maintenance requirements.

Rations in the first and third groups utilize roughages to the maximum. The remainder of the cows' nutrients is made up from concentrates. The roughage-concentrate ratio for group 2 conforms to feeding averages used in the rations of the present Beltsville herd.

If feed efficiency ultimately proves to be an independent, inheritable factor, and practical criteria are worked out for determining differences between cows, dairymen will be able to choose breeding animals for their feed-conversion efficiency as well as their productivity. ☆







# CITY FOLKS AND Convenience foods

Families spend much less on newer easy-to-serve foods than on well-established convenience items

■ THERE ARE MANY convenience foods on the market, but the truly *new* convenience foods take only 4 percent of the food dollar of urban households, a USDA survey shows.

Of these foods, frozen vegetables and frozen juices ranked highest in household use. Four out of 10 urban households of 2 or more persons used a frozen vegetable at least once during the survey week, and 3 out of 10 used frozen juices. Cake mixes were used by 2 out of 10 households.

Many of the most important convenience foods are not new. Well-established easy-to-serve foods—such as store-bought bread, ice cream, canned soups, hamburger, frankfurters, and luncheon meats—claim a fourth of the urban household food dollar.

## Many buy long-known foods

Nearly all the families purchased bread during the survey week, and 9 out of 10 used other bought baked goods. Purchased ground beef,

lunch meat and frankfurters were popular, being used by 7, 6, and 4 respectively out of 10 urban households. Six out of 10 households bought ice cream, 5 out of 10 canned soups.

A third of the families used at least one of the ready-prepared food mixtures—some new, some old. Examples: poultry and meat pies, spaghetti with tomato sauce, corned beef hash, chili con carne, ready-to-serve salads, ravioli, macaroni, and cheese dinners, and Chinese-style foods.

Upper income families make greater use of some convenience foods than do lower income families, and the same is true for city families compared with farm families. But both newer and older easy-to-serve foods are used by all groups.

## Survey provides useful data

These findings come from the 1955 Household Food Consumption Survey made jointly by the Agricultural Research Service and the Agricultural

Marketing Service (AGR. RES., January 1957, p. 8). Data from it provide a basis for measuring the relative importance of different kinds of food in a week's consumption.

The first report, "Food Consumption of Households in the United States," gives tables for comparing urban, rural nonfarm, and farm households and for measuring differences among income groups. Additional reports give the same kind of information for each of four regions. Single copies of the reports are available from USDA's Office of Information, Washington 25, D. C.

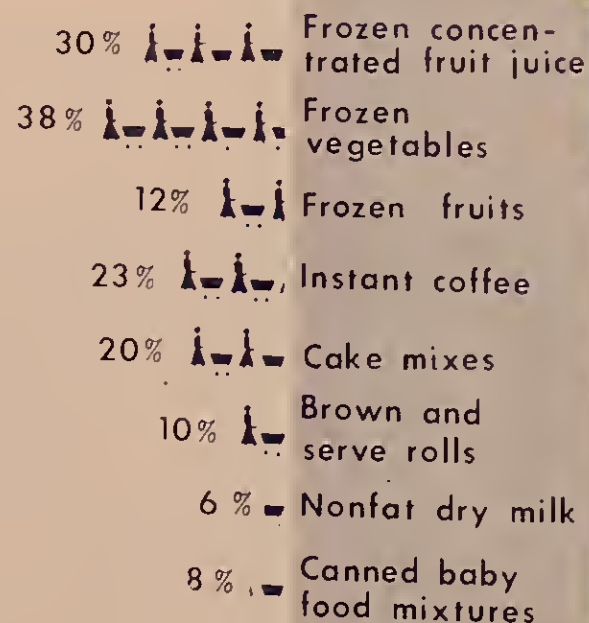
Definitions of "new" and of "convenience foods" can be a matter of argument. ARS home economist Gertrude Weiss points out. Prewashing and trimming of vegetables are undoubtedly both a new departure and a great convenience to homemakers, but the impact of these services was not measured. Moreover, the list of convenience foods could be expanded or contracted in various ways. For example, it could be argued that serving a glass of milk takes almost no household labor, hence milk should be listed as a convenience food.

## Prekitchen work considered

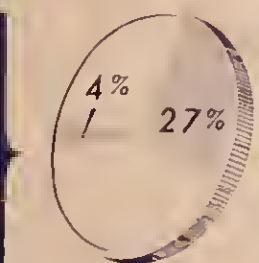
Foods listed in the diagram at left were selected after considering both convenience and amount of prekitchen processing. This interpretation suggests some of the many uses that can be made of data in the survey reports. Home economists and nutrition teachers, businesses and farm groups will find the information useful. ☆

## New convenience foods SUCH AS

Families using in a week



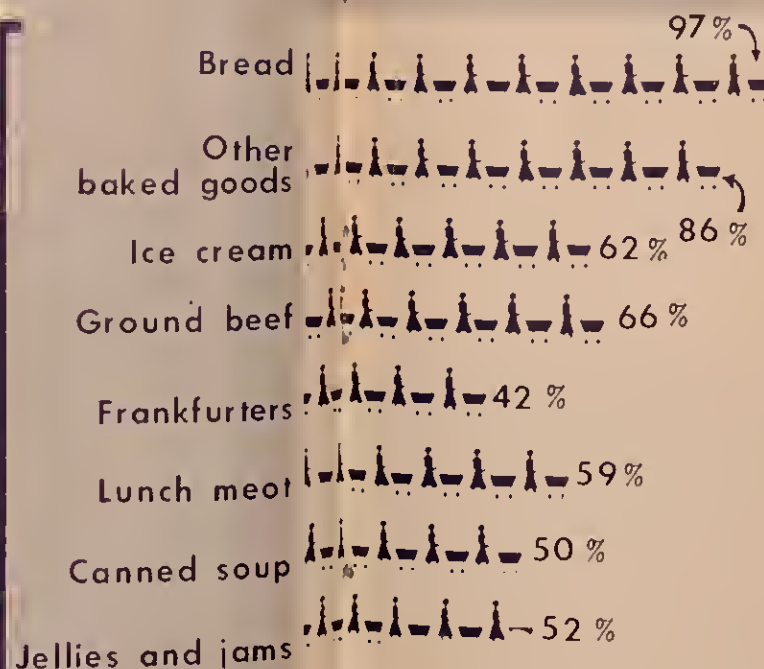
## Food Dollar



\$26 spent weekly for food eaten at home by urban households of 2 or more

## Old convenience foods SUCH AS

Families using in a week



## How to Control Pickle Softening



Cucumber-flower mold growth produces enzymes behind this unpredictable source of loss

■ SOFTENING of salt-stock cucumbers during brining and storage has been a serious cause of loss to commercial pickle packers—loss amounting to an estimated \$1 million a year.

In the past, softening losses have been unpredictable. Cucumbers might go soft in brining vats or might not. No one knew why it happened or how to prevent it. When cucumbers did soften, packers could either dump the entire lot or, if softening was not too advanced, use the cucumbers for lower priced pickle products.

This loss is being controlled through cooperative research by various agencies—USDA's Food Fermentation Laboratory, Raleigh, operated jointly by the ARS Southern Utilization Research Branch, New Orleans, and North Carolina Agricultural Experiment Station, Raleigh; and the processing and seed industries.

## Flowers are trouble source

Researchers have isolated from cucumber brines two types of enzymes—pectinolytic and cellulolytic—that attack the pectin and cellulose in the cucumber and cause it to soften. Microbial studies indicate that these enzymes are produced chiefly by growth of molds in the cucumber





**1.** Opened pistillate flower (left) on small cucumber dries as cucumber grows (right). These flowers get in brine, cause serious pickle spoilage.



**2.** Vats of salt-stock cucumbers at a brining station are checked for success of the fermentation. Pickle softening causes loss of entire vats.



**3.** Salt-stock pickles at times soften to point of mushiness. Sensitive tests have been developed for detecting the softening enzymes in brine.

flowers. These molds flourish in the withering flower as the cucumber develops. When flowers go into the vat along with the cucumbers, the enzymes diffuse through the brine and thence into the cucumber tissue.

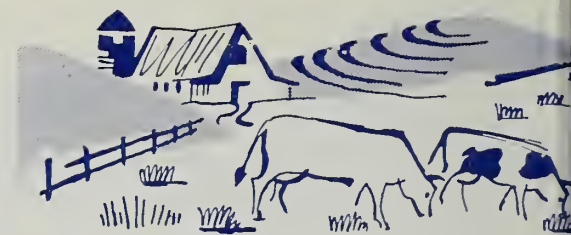
Since no practical economical method for removing all the flowers has been developed, it is necessary to get rid of the enzymes in some other way. Softening-enzyme concentration reaches its peak in the brine during the first 24 to 48 hours after vats are filled. By draining away the original brine at the end of 36 to 48 hours and replacing it with a new brine, researchers markedly reduced the enzymes. A test to detect the presence of softening enzymes has also been devised by these scientists.

The practice of draining vats threatened by softening has been widely adopted by the pickle industry, particularly by southern operators. It saves thousands of bushels of cucumbers annually at low cost—2 or 3 cents a bushel—and gives consumers firm, crisp, high-quality pickles.

### New work looks promising

Present research is aimed at learning more about enzymatic softening and methods of preventing it. Some promising work is being done on the use of naturally occurring softening-enzyme inhibitors obtained from plant sources. In addition, machinery manufacturers are trying to develop a way of mechanically removing the blossoms, and plant breeders are investigating the possibility of developing a cucumber that drops its blossom more readily. For the present, however, the procedure of draining off the original, enzyme-laden brine is the most practical method to prevent softening of salt stock.

(John Etchells, USDA bacteriologist in charge of the Food Fermentation Laboratory, has been given the 1956 National Pickle Packers Association Hall of Fame award.) ☆



■ SUPERIOR FORAGE PLANTS are giving an increasingly prosperous look to eastern meadows and promise better days for livestock farming there. But it will take equally superior management to cash in on the promise.

Cooperative studies by USDA and several State experiment stations show that the advantage of these forages depends on how well crop and practice suit a farm's livestock need.

Greatest economy comes from fertile, tillable soils planted to such nutritious species as brome, sudan, and orchard grasses; Ladino clover, birds-foot trefoil, and the new alfalfas; and combinations of a grass and a legume. Such forage crops respond best to superior technology, too, whether they are used for grazing, fresh feeding, or making preserved forage.

One of the major variables observed by ARS agronomist V. G. Sprague of the U. S. Regional Pasture Research Laboratory, State College, Pa., is the combination of forage crops chosen for a specific farm's needs. Species, varieties, and strains must not only be superior. They must also fit together well, both in grassland combinations and in seasonal succession, to give the greatest duration of grazing, high nutritive value, and the maximum total forage.

### Care can aid balance, stand

Proper fertilization, harvest timing, and recovery time after cutting or grazing all help preserve species balance and total stand. These management practices also benefit quality and yield. Irrigation may be a useful device where facilities are available and other management factors have been raised to the optimum.





# GOOD MANAGEMENT - GOOD PASTURE

**Crop combinations, fertilizer, harvest timing are important considerations**

Permanent pastures are largely restricted to low-growing species, such as bluegrass and white clover. These pastures are declining in importance, yet still have a place in modern farming. They use nontillable land. The bluegrass-white clover combination is welcome for spring and fall grazing. Timely fertilizing and liming help keep permanent pastures thrifty.

## Legumes require protection

Legumes usually are the key to economical plant mixtures but are most difficult to maintain. Vigorous grasses tend to shade out and starve the legumes. Sprague suggests that pasturing practices should, therefore, be aimed at retaining the legume.

Forage plant types vary biologically and the harvest almost always favors one species at the expense of the others. For greatest advantage, the conflicting needs must be balanced—the grass curbed at times or otherwise handled to protect the legume. Seeding grass thin helps some, but proper cutting and fertilization help more. Where legumes have disappeared, nitrogen is needed to boost yield and protein level in pasture grass.

For a closer look at pasture management, consider some grazing possibilities on a typical Central Pennsylvania

farm specializing in livestock and cash crops. There's usually small grain to graze in late fall and again in late winter. Permanent pasture will be ready for grazing early in the fall and again in the following spring.

On this farm, pasturing through the summer months might largely depend, for example, on orchardgrass-Ladino clover, orchardgrass-alfalfa, or brome-grass-alfalfa mixtures. Sometimes a planting of an annual such as sudan grass is needed for the possible hot, dry periods of late summer.

These combinations would be most important for both grazing and storage as silage or hay. The handling of these mixtures, especially in the grazing phases, may be the key to success of the program as a whole.

## Timing of harvest critical

Taking a first harvest of orchardgrass-Ladino meadow when the grass was coming into head—the customary practice—was too late in the State College studies. Although vegetation is heaviest at that time, grass may already have weakened the clover. Starting the first grazing when the grass was 8 or 10 inches high gave nutritious forage and favored the clover. Similarly, cutting alfalfa-grass mixture when alfalfa is in bud,

rather than in bloom, gives a better quality hay or silage. Earlier cutting also may give an extra grazing.

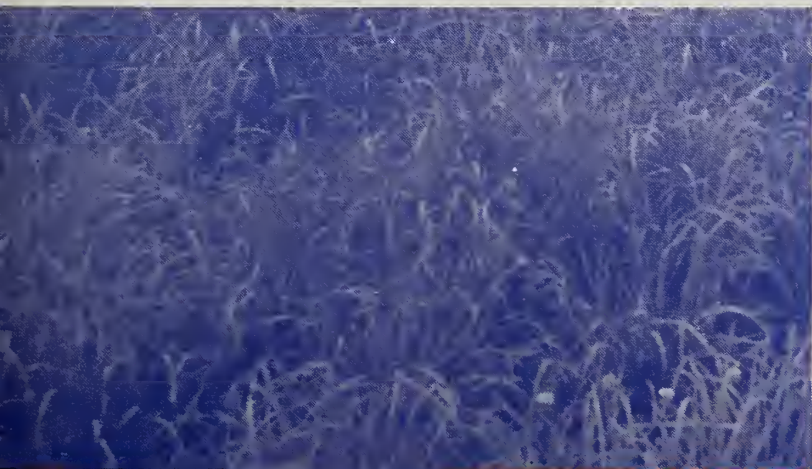
There's a question of how important irrigation might become in eastern forage production, particularly since droughts tend to be brief in most of the region. At State College, ARS soil scientist R. R. Robinson found one thing clear: in general, forage plants can stand much drought—even some wilting—before artificial watering becomes a critical need.

## Dry plants come back fast

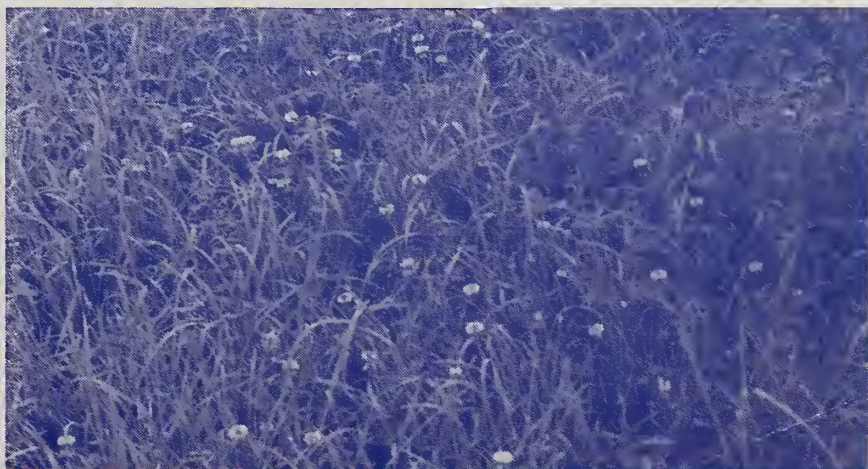
Even after a fairly long period without growth, watering caused quick recovery in shallow-, medium-, and deep-rooted species alike. Pure stands of alfalfa and orchardgrass, allowed to wilt and then clipped and watered, produced as much forage at the next cutting as plants under frequent irrigation. Some eastern forages—especially timothy, brome-grass, and tall oatgrass—haven't responded well to irrigation except in extreme drought. Continued moist growing conditions may foster diseases and cut fall growth of these plants.

County agricultural agents and State extension or experiment station specialists are familiar with special management needs of their areas. ☆

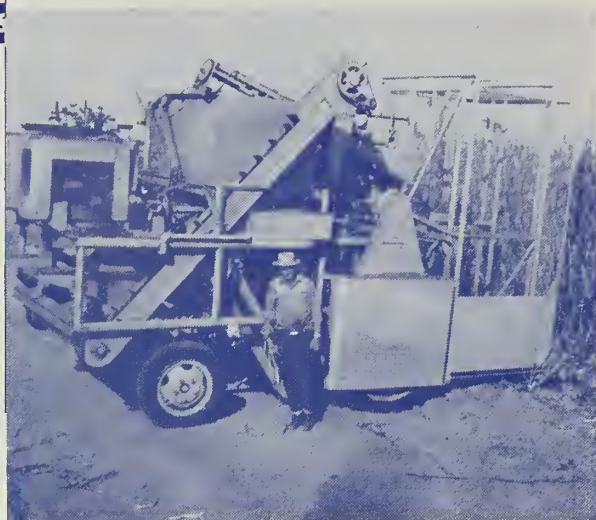
**DELAYING FIRST GRAZING** of meadow until orchardgrass is in the boot lets grass smother Ladino clover, as midsummer view shows.



**STARTING FIRST GRAZING** when grass was 8 or 10 inches high, however, helped clover hold its own, kept plant mixture in balance.

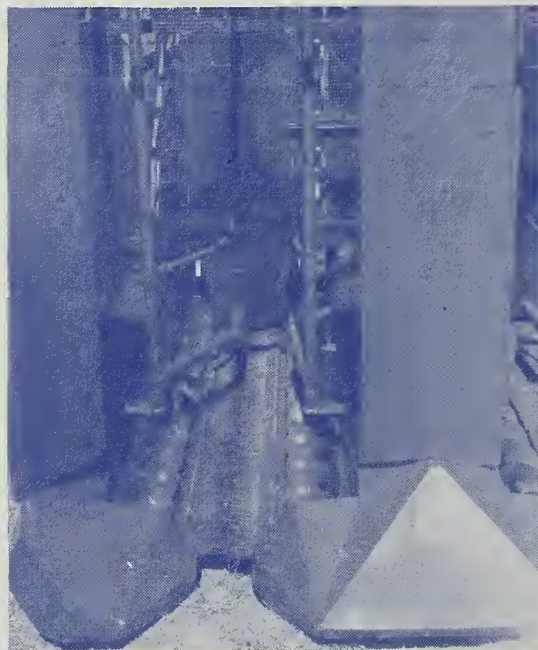






**GIANT COMBINE** harvester-huller, based on the experimental model created by ARS, had little waste in harvesting 6- to 12-foot castorbeans in California. It's adapted to the tall varieties grown in the Southwest.

**SUCCESS IS DUE** to flat nylon brushes that intermesh around plants to catch seeds. Pods knocked loose by striker arms bounce from the oscillating brushes into conveyors to move to the huller and ultimately to bin.



## CASTORBEANS

## ARE *Ready*

**New harvesters and new dwarf varieties give us the basis for building a sound domestic industry**

■ EVENTS OF LAST FALL promise a competitively self-sufficient castorbean industry we've hoped for and a new use for part of our cotton land. Two obstacles to economical castorbean production—costly harvesting and low yields—were overcome.

Combine harvester-hullers harvested tall castorbeans in California and short ones on Texas' high plains without waste. In field tests, a new dwarf variety set a Great Plains record for dwarf castorbeans by yielding over 2,700 pounds per acre, with irrigation and ample nitrogen.

### Healthy industry foreseen

The oilseeds industry already hopefully predicts that Cotton Belt growers can produce castorbeans profitably at 6½ to 8½ cents per pound,

the recent farm price in world competition. A dependable industry might win America's market—outlet for about 350,000 crop acres. At 6½ cents, it might even tap new uses in the plastics and other industries.

### Cooperators create machine

Researchers—USDA, State, and private industry—have opened up these opportunities. ARS agricultural engineer L. G. Schoenleber and associates, cooperating with the Oklahoma Agricultural Experiment Station at Stillwater, created the basic design of the new harvesters. Last June, one associate, G. E. Coppock, and representatives of the Kern County Land Company and the Hopper Machine Works, of Bakersfield, Calif., built the first experimental

harvester to successfully handle the tall varieties grown in California.

The Hopper machine, costing about \$13,000, was completed and tested September 15. More than 100 acres of beans from 6 to 12 feet tall were harvested at .8 to 1.3 acres per hour. Seed loss was less than 10 percent and can be further reduced.

Schoenleber took the 1956 version of his experimental harvester for low-growing castorbeans to the Plainview, Texas, area last November and harvested 70 acres of castorbeans from 3 to 6 feet high. This included 11 acres of the new 3-foot dwarf variety grown for seed increase.

The USDA machine was built onto a standard row-crop-type farm tractor. The laboratory model used in Texas would cost approximately \$5,000 less tractor. Even at that price, the harvester apparently would be more economical to use than costly hand picking or Schoenleber's earlier, less-efficient harvesting machines.

### Dwarf variety outstanding

The new dwarf variety—one of several showing promise—was developed by ARS plant breeder D. D. Poole and the Texas Agricultural Experiment Station. It has a sturdy stem, short internodes, compact fruiting spikes, and uniform height, and is relatively high yielding and nonshattering. It far exceeds any variety grown in irrigated areas of the high plains in wind resistance and suitability for machine harvesting.

Creation of a productive low-growing type practically assured a future for castorbean growing on the Texas and Oklahoma high plains, where high winds tangle the taller plants and cause harvesting losses.

Eighty pounds of the new seeds were planted in 1956 and multiplied to 22,000 pounds of certified seed. That's enough to plant 2,200 acres, or 3½ to 4 times last year's plantings on the high plains. ☆



# A Plan for Breeding Better Hogs

Similar to hybrid-corn improvement, this involves recurrent selection based on crosses of two strains that combine well

■ A USDA BREEDING and selection plan may give hog breeders improved hybrids and increased productivity.

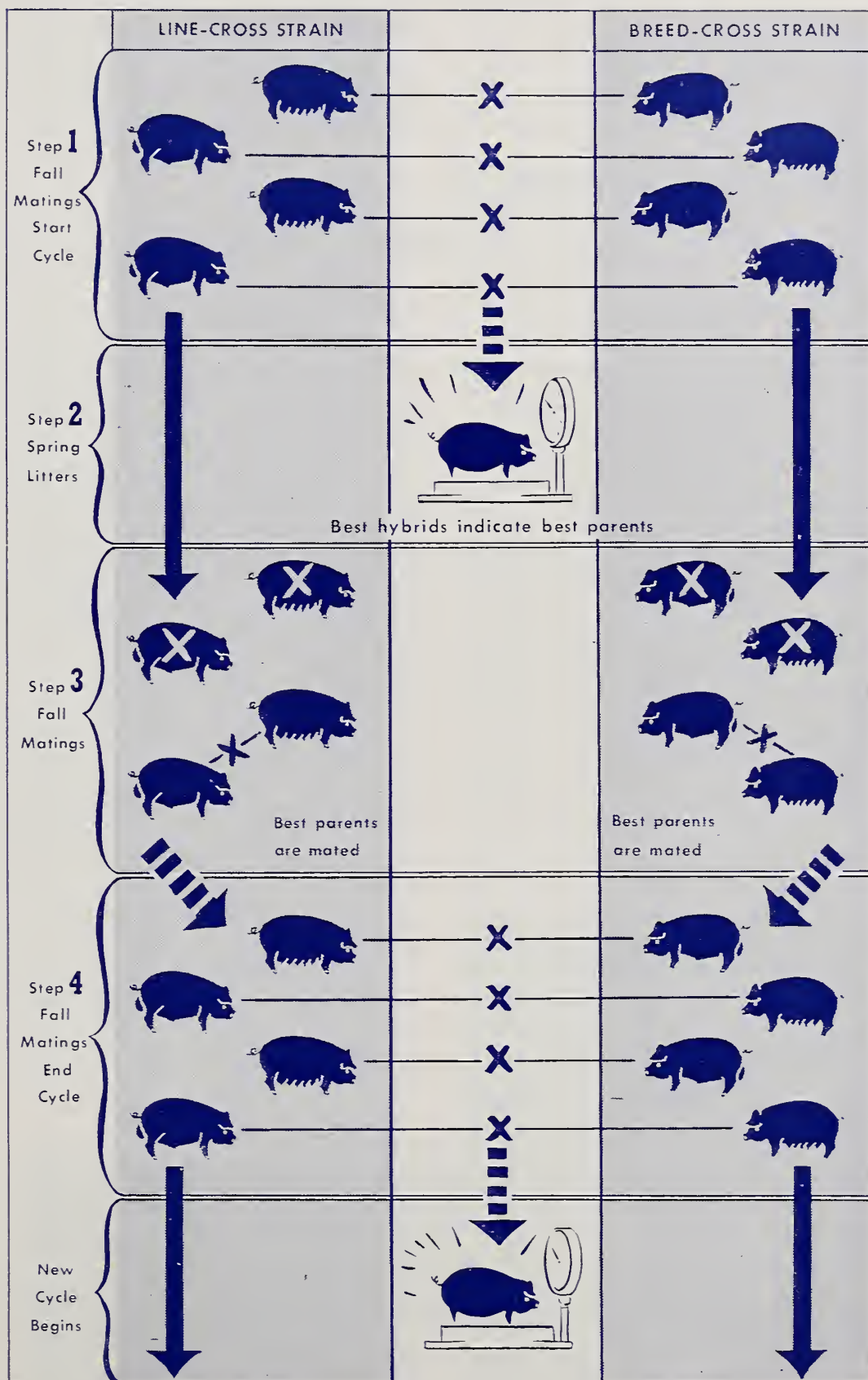
This plan, similar to that for increasing hybrid corn yields, is known as "recurrent reciprocal selection for specific combining ability." Studies at the Agricultural Research Center, Beltsville, Md., will continue for 10 to 15 years. Similar work is being done at the Montana Agricultural Experiment Station, Miles City, in cooperation with ARS.

Four steps are involved: (1) crossing, at 2-year intervals, 2 strains of hogs known to combine well; (2) testing the cross progeny for economically important characteristics; (3) retention in the 2 strains of breeding animals proved best by the performance of the cross progeny; and (4) propagation of the 2 experimental strains by using selected animals.

## Two strains are maintained

One of the two strains of animals being used in the Beltsville tests was developed from line crosses and the other from breed crosses. The line-cross strain was formed from all the possible combinations among three inbred lines—Landrace, Landrace-Large Black, and Landrace-Poland China. The breed-cross strain was started from crosses among noninbred purebred stocks of Chester White, Hampshire, and Poland China. Two control strains derived from these crosses are also being maintained by the research workers.

Animals of each strain are first mated with animals of the opposite strain. The resulting cross progeny are evaluated on rate of growth,



TWO STRAINS are used to improve hybrids in this "recurrent reciprocal selection" plan.



efficiency of feed utilization from weaning to about 225 pounds, and carcass characteristics such as thickness of back fat, percentage of preferred cuts, and loin eye-muscle area. Dams' prolificacy and mothering and nursing ability are also considered.

Parents of the best cross progeny are retained to reproduce each strain. Progeny from these selected parents are then crossed with progeny of selected parents of the opposite strain

to initiate the next cycle of selection. Scientists thus hope to increase the hybrid vigor in later generations.

#### Good combinations expected

ARS animal husbandman H. O. Hetzer, who heads the Beltsville study, sees in it a potential means of increasing the efficiency of market hog production. Recurrent reciprocal selection is expected to produce, in progressively greater numbers, desir-

able gene combinations not obtainable by conventional methods.

Researchers foresee the possibility of establishing superior pig strains through recurrent selection at places such as agricultural experiment stations or at large commercial breeding establishments. These places could supply animals for farmers wishing to increase the hybrid vigor of their stock by introducing and crossing superior new strains of swine. ☆

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## DISPOSING OF POULTRY WASTES

■ A troublesome old problem of disposal of dead chickens on poultry farms and waste from poultry dressing plants has been solved. It is done by digesting the carcasses in a heated septic tank. That's more convenient than usual methods.

Preliminary studies indicate that a 500-gallon tank or 2 smaller ones would meet the needs of a 10,000-hen or 20,000-broiler farm. Both steel and concrete tanks were satisfactory when insulated with 4 inches of moisture-proof foam plastic.

The study was made by ARS engineers W. A. Bailey and W. A. Junnila in cooperation with W. A. Aho and W. C. Wheeler of the Con-

necticut Agricultural Experiment Station, and H. C. Wheldon of the Maine station. Within a 2-week test period, a tank warmed to 100° F. disposed of carcasses—all but the bones. It took 2 to 3 kilowatt hours of current per day to maintain the temperature in a 500-gallon tank. Further study should give a better understanding of tank capacities, efficient operating temperatures, and costs of operation.

#### Bacterial action does job

Like most disposal methods other than incineration, the new method utilizes bacterial action to break down flesh. Mesophilic bacteria, which do this, must have a moderate tem-

perature for growth. At Storrs, Conn., a test location, ground temperature is about 55° F.—low for the process. For example, it takes these bacteria about 74 days to break down sewage at that temperature.

Bacterial activity accelerates as temperature rises to a maximum of about 100° F.—is fastest above 90° F. In tests at 100° F., carcass decomposition was noticeable at the end of the first day, and by the eleventh day, was virtually complete. But at 80° F., decomposition was only slight by the eleventh day; at 50° F., bacterial activity was undetectable.

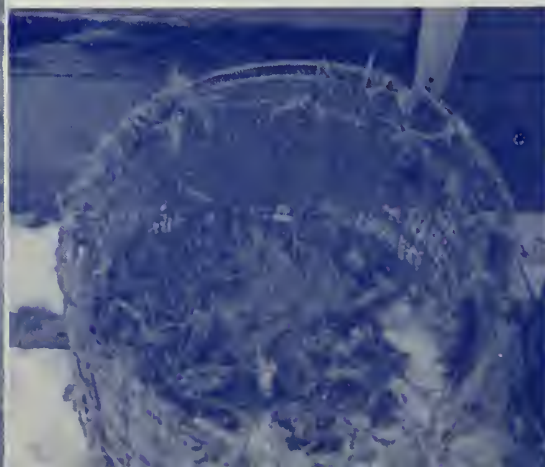
Decomposition releases acids that ultimately stop bacterial growth. Neutralizing with mason's lime solved the problem. Also, heating the tank by adding hot water diluted these acids and kept the bacteria active.

#### Two access fixtures tried

Two fixtures proved satisfactory for putting carcasses into the tank. One was a tight-covered 8-inch stand-pipe reaching up a foot above ground and down into the water to a depth of a foot. The other was a tight-lidded bottomless milk can that researchers welded to the top of the steel tank.

Drainage field requirements vary with local soil conditions, as is true with sewage disposal systems. ☆

SEPTIC TANK, one of the several tested, is surrounded by waterproof insulation. The milk can welded on top serves as a gas-tight opening through which to insert dead chickens. Residue of feathers and bones was all that remained from 70 pounds of carcasses after 11 days at a controlled temperature of 100° F.





## Plan new laboratory

A contract for architectural and engineering services has been signed for the proposed new USDA Animal Disease Laboratory at Ames, Iowa.

To be supervised by the General Services Administration, the contract is with the Ralph M. Parsons Company, Los Angeles, Calif., and Brooks-Borg, Des Moines, Iowa. These two firms will perform their services jointly in consultation with ARS, which will run the laboratory.

Facilities to be designed include laboratory buildings, a central heating and emergency power plant, sewage decontamination plant, certain equipment, utilities, roads, walks, and fencing. Construction is expected to begin in the fall of 1957.

This new center for research and regulatory work on animal and poultry diseases will be built on a 318-acre tract of farmland just east of Ames near Iowa State College.

## Sampling shortcut

Small squares of aluminum foil make ideal containers for soil samples collected for moisture and other tests in the laboratory, USDA soil scientist H. A. Weaver has reported from Auburn, Ala. The soil can be put in the center and the sides drawn up and twisted tightly together to contain the soil and its moisture.

Preliminary studies showed no appreciable soil moisture losses where initial weighing was done within 4 hours of sampling. This time might vary for materials other than soil.

Foil sheets are more convenient to carry than the metal cans or jars usually used. Laboratory scales can be set for the uniform tare weight of foil where large numbers of samples

are being tested. That eliminates a time-consuming operation. Where a standard pattern of sampling is followed and the samples are packed in trays, recordkeeping is simplified by labeling only the tray. Trays of samples, with the foil loosened, can be put into the oven for drying.

This aluminum-foil technique may be applicable to many field sampling programs, involving the laboratory testing of such materials as fertilizers, chopped forage, and seeds.

Foil is inexpensive—about one-fourth cent for a 6- by 6-inch sheet. It can be discarded when used—that's cheaper than cleaning containers.

## Cooking with honey

Substitution of honey for all or part of the sugar in some baked goods adds to color and flavor and improves texture. Work by Kansas Agricultural Experiment Station, Manhattan, has also shown that use of honey to sweeten cakes is now commercially possible for the first time.

This work, aimed at expanding bakery use of honey, is done under contract with ARS Eastern Utilization Research Branch, Philadelphia.

Cakes with a high honey content stay moist and fresh-tasting longer than cakes without honey. But if more than a third of the sugar is replaced with honey, cakes may be flat and have a burned color and flavor.

Researchers controlled these undesirable reactions by raising the acidity of the batter during final baking stages. To do this, they used potassium bitartrate coated with a stearate, which melts and releases the acid near the end of baking.

Honey—5 to 50 percent—added noticeably to the flavor and color of some cookies. Substituted for 6 per-

cent of the sugar in white breads and up to 12 percent in dark breads, honey gave a rich flavor and aroma to both products. The breadmaking process that did not have to be altered.

## Our cortisone sources

A plant that brings death and disease to some livestock in the Southwest holds promise as a pain reliever in man. This plant—*Agave lecheguilla*—contains smilagenin, from which cortisone can be made by chemical means. Cortisone is widely used to treat arthritis, inflammatory eye diseases, asthma, and other ailments.

This unwanted weed, covering thousands of square miles in the Big Bend region of Texas, is often fatal to sheep and goats. Although scientists have found plants yielding more cortisone, USDA researchers say *Agave lecheguilla* is potentially important because it grows in such profusion in our country and could relieve our need for foreign supplies.

If *Agave lecheguilla* can be made to produce cortisone economically, harvesting the plant may lead to recovery of land now ruined by the weed. It may also provide an emergency source of cordage fiber and brush bristles—normally imported.

Plant hunters have searched remote areas of the Americas, India, and Africa for plants with substances to make cortisone and other drugs. More than 7,000 plant collections

**CORTISONE sources:** roots of *Dioscorea* yams (left) from Mexico, leaves of *Agave lecheguilla* (center) from Texas, and leaves of *Yucca gloriosa* (right) from the Southwest.





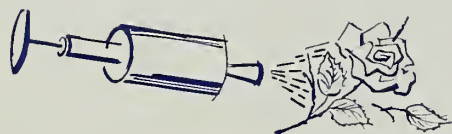
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have been shipped for analysis and trial cultivation to the ARS Eastern Utilization Research Laboratory, Philadelphia, and U. S. Plant Introduction Garden, Glen Dale, Md.

At the present time, tropical yams of the *Dioscorea* family are the most abundant and readily available source of cortisone-starting material. These yams, various yucca plants, and agaves are now being considered for possible establishment in this country as cortisone sources.

### **A double-punch dust**

Adding wettable sulfur greatly increased the effect of copper dust in controlling blackspot fungus disease of roses in USDA research. This booster effect (synergism) between



the two chemicals more than doubled flower yield of susceptible roses.

Synergism of this dust mixture in blackspot control has been suspected for some time. It was not definitely established, however, until ARS plant pathologist W. D. McClellan and entomologists E. A. Taylor and F. F. Smith set up experiments 3 years ago at the Agricultural Research Center, Beltsville, Md., to measure the fungicidal effect of sulfur with and without copper. When 3.4-percent copper from Tennessee Copper 34 and 25-percent sulfur from 325-mesh dust-

ing sulfur were used separately, they had little effect on blackspot. But when they were mixed, they cut down blackspot substantially.

Blackspot is a serious fungus disease of roses. Its effect on flower production had been observed in a general way but was not fully measured before these tests were made.

### **Slingshot sorter**

An experimental machine based on the slingshot principle has been developed by USDA scientists to sort cottonseed according to quality.

The differentiator—as this new machine is called—shoots the cottonseed outward like a pebble or paperwad shot out of a slingshot.

The farther a seed is thrown, the higher its oil and nitrogen content—characteristics of high-quality seed. The closer to the machine the seed falls, the higher its moisture, linters, and free fatty acids content—characteristics of low-quality seed.

ARS engineers devised the plan of feeding the cottonseed snugly between two flat, fast-moving belts. The particles are thrown out in stream-like fashion and fall from 5 to 100 feet beyond the projector.

Commercial use of such a machine could aid in producing high-grade cottonseed products and could reduce delinting cost. It might also be used profitably to sort out lower grade seeds for early processing, since they deteriorate more rapidly.

Researchers hope to improve the

machine to increase recovery of the lower quality seeds, which it now tends to separate with the trash.

### **Sick time—lost time**

Sickness and accidents destroy more productive farm time than most people think. USDA agricultural economist E. E. Gavett, found in a study that 1 out of every 3 farmers surveyed in Michigan loses time from work because of illness or accidents.

Almost 82 percent of the farmers were incapacitated an average of 22 full days. The high average is due to a few farmers having prolonged illness—as long as 182 days in one case, according to the ARS survey.

Actually, three-fourths of the men reported fewer than 22 days incapacitation. But Gavett says many people interviewed probably did not recall all the days when they were ill.

Six percent reported an average loss of 53 part days, but two-thirds of this group reported illness amounting to a month or less. Gavett said part-time losses probably do not include periods when the ill farmer struggles



to work—then quits completely, staying home full days.

Since sickness and accidents take so much time, Gavett thinks farmers should conform to health and safety codes of public and private agencies.